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# PATENT ABSTRACTS OF JAPAN

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(21)Application number : 03-356699 (71)Applicant : NIKKO KINZOKU KK  
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## (54) SHADOW-MASK MATERIAL

### (57)Abstract:

PURPOSE: To develop an Fe-Ni shadow-mask material for the highdefinition color television picture tube having more uniform etching drillability than before.

CONSTITUTION: The crystal grain size of the Fe-Ni shadow-mask material is controlled to  $\geq 9.0$  fineness number, and the aggregation degree of the (100) face on the rolling surface is adjusted to <35%. The rolling and annealing history, annealing temp. before final rolling and final draft and the annealing temp. and time when final annealing is applied are controlled. Since the crystal grain size is controlled to  $\geq 9.0$  fineness number, the etched hole and wall surface are smoothed. As the aggregation degree of the (100) face on the rolling surface is controlled to <35%, the crystals are oriented at random, and the etching uniformity is improved. The shadow-mask material is applicable to the high-definition color television picture tube.

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## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] Fe-nickel system shard USUKU material characterized by for a grain size number being 9.0 or more by the grain-size number, and the degree of set of the {100} sides to a rolling side being less than 35%.

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[Translation done.]

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the shard USUKU material for the picture tubes for Fe-nickel system high definition color television which specified the grain size number and the texture to be specific ranges especially about the shadow mask material used for the picture tube for color television.

[0002]

[Description of the Prior Art] The shadow mask is used for the color-television picture tube as an electrode for color sorting.

[0003] As a material for shadow masks, although the low carbon aluminum killed steel has so far been used, recently, the umber alloy (Fe-36%nickel) which has a low thermal-expansion property is used more often.

[0004] It is based on the following reason. That is, since bombardment [ electron beam / the electron beam dispatched to the shadow mask passes puncturing of a shadow mask and also / a shadow mask non-opening front face ] directly when operating the color picture tube, a shadow mask is heated, so that it sometimes amounts to no less than 80 degrees C. Under the present circumstances, although the fall of color purity arises that thermal expansion is a large material according to the thermal expansion of a shadow mask, the fall of the color purity by this thermal expansion will be prevented by use of the low Fe-nickel system umber of coefficient of thermal expansion.

[0005] Although such a shadow mask has some manufacture methods, after repeating rolling and annealing and making Fe-nickel system umber material into the shadow mask material of suitable thickness with the last cold rolling through forging from an ingot typically, it is indispensable to perform the last recrystallization annealing if needed and to form much punching there by etching of the common knowledge which uses ferric chloride. Then, the process of common knowledge, such as fabrication and melanism processing, is carried out, and a shadow mask is manufactured.

[0006] However, it poses a problem that this Fe-nickel system umber alloy is inferior in etching punching nature compared with the conventional low carbon aluminum killed steel. Since etching speed changes with crystal orientation of each crystal grain, if the Fe-nickel system shadow mask material which is the polycrystalline substance is \*\*\*\*\*ed, irregularity will be made along with crystal grain, and proper punching will not be formed by this problem, but it will reduce the quality of a shadow mask.

[0007] so that crystal grain is small about this -- the hole after etching -- a configuration and an etching wall surface become smooth, it is known conventionally that the quality of a mask will improve, and the number of the crystal grain which starts a puncturing wall in JP,61-39343,A is specified Furthermore, achieving equalization of etching by raising the degree of set of the {100} sides to a rolling side with making crystal grain detailed conventionally was performed so that it might be indicated by JP,59-149638,A, for example.

[0008]

[Problem(s) to be Solved by the Invention] However, this was also insufficient as a material corresponding to the high definition mask which need is increasing by recently. The technical problem of this invention is developing the shard USUKU material for the picture tubes for Fe-nickel system high definition color television which has etching punching nature more uniform than before.

[0009]

[Means for Solving the Problem] As a result of this invention persons' doing various researches in view of this point, it is a problem rather to have raised the degree of set of the {100} sides to a shadow mask rolling side conventionally, and making the degree of set of {100} sides as low as possible conversely as an object for high definition masks found out the desirable thing. this invention offers conventionally [ this ] the Fe-nickel system shard USUKU material characterized by for a grain size number being 9.0 or more by the grain-size number based on reverse knowledge, and the degree of set of the {100} sides to a rolling side being less than 35%.

[0010]

[Function] so that crystal grain is small -- the hole after etching -- a configuration and an etching wall surface become smooth, and the quality of a mask improves a grain size number carries out to 9.0 or more by the grain-size number -- the hole after smooth etching -- a configuration and an etching wall surface are guaranteed By making the degree of set of the {100} sides to a rolling side into less than 35% as crystal orientation, crystal orientation becomes random and improves etch uniformity.

[0011]

[Example] With Fe-nickel system shard USUKU material, the thing of the Fe-34 - 38-% of the weight nickel range represented by the umber alloy (Fe-36%nickel) can be included, and one or more sorts of Si, Mn, Cr, Co, Ti, Zr, Mo, Nb, B, V, Be, aluminum, Ta, and W can also be added as an alloying element.

[0012] It is forming by the photo-etching technology of the common knowledge which it performs last recrystallization annealing or stress relief tempering if needed after Fe-

nickel system shadow mask material's repeats rolling and annealing after forging and considers as the shadow mask material of suitable thickness with the last cold rolling from the ingot ingot of composition suitably, it applies a photoresist there for much punching, carries out etching processing by etching reagent like [ after printing and developing a pattern ] ferric chloride, and removes a resist after that. It is produced.

[0013] On the occasion of etching, the crystalline structure is important. In this invention, a grain size number is preferably set to 9.5-12 9.0 or more by the grain-size number. And the degree of set of the {100} sides to a rolling side needs to be less than 35%. The desirable degree of set is less than 30%.

[0014] The reason for limitation is explained. so that crystal grain is small -- the hole after etching -- a configuration and an etching wall surface become smooth, it is known conventionally that the quality of a mask will improve, and the number of the crystal grain which starts a puncturing wall in JP,61-39343,A mentioned previously is specified. Also in this invention, this point is the same, and it is required for a grain size number to be 9.0 or more by the grain-size number. It considers as the range of 9.5-12 preferably. As for a grain-size number, a grain size number is based on a convention of JIS. Moreover, it brings [ since the direction of the crystal grain which adjoined each other even if the crystal grain of each of even if was small, when one direction was gathered, although making the degree of set of {100} sides high so that it may be known by JP,59-149638,A had been performed conventionally becomes almost the same / in / etching / in practice ] the same result as the case where crystal grain is large and is not desirable. Then, the more nearly random possible one as crystal orientation needs to be good, and the degree of set of the {100} sides to a rolling side needs to be less than 35%. The desirable degree of set is less than 30%.

[0015] After hot rolling whose desirable manufacture conditions are as follows in this invention, it is the degree of rolling which does not exceed 80%, and after performing rolling and recrystallization annealing, it is the degree of rolling which does not exceed 80% again, and rolls out. Next, it anneals at 650-1150 degrees C for 5 seconds to 60 minutes, and crystal grain is made detailed. A degree is made into 10 - 50% a ultimate-pressure total, and when the last recrystallization annealing is required, it carries out at 650-1150 degrees C for 5 seconds to 60 minutes.

[0016] (An example and example of comparison) The Fe-36%nickel alloy was used as a chemical composition of a test specimen. The test specimen which has the cold-rolled workability before the last recrystallization annealing, the grain size number which the last recrystallization annealing conditions are changed and is shown in the 1st table, and the degree of set of {100} sides from the same ingot was produced. In addition, after

the last recrystallization annealing, all the test specimens performed the last cold rolling of 15% of workability, and were taken as the cold-rolled board of 0.15mm of board thickness.

[0017] Much puncturing was formed in this cold-rolled board by the etching reagent which makes ferric chloride a principal component, and the etching punching nature in this case was evaluated. The result is also shown according to the 1st table. In addition, the mask pattern used the difficult high definition thing of etching.

[0018]

[Table 1]

[0019] As shown in Table 1, the example of this invention was able to show good etching punching nature compared with the example of comparison, and was able to generate the mask of the good quality which has uniform punching.

[0020]

[Effect of the Invention] It can succeed in developing the Fe-nickel system shadow mask material which has etching punching nature more uniform than before, and the shadow mask for the picture tubes for high definition color television which need is increasing by recently can be coped with.

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[Translation done.]